# 2.1 Uniform Acceleration

September 25, 2017 11:17 AM

## Def$^n$

| Scalars (magnitude only) | Vectors (with direction) |
| --- | --- |
| distance - how far moved | position - location with reference to something |
| ex run around a 1 km track<br>$d$ = distance = 1 km<br>$\vec{d}$ = displacement = 0 km | displacement - change in position<br>$\Delta\vec{x} = \vec{x}_f - \vec{x}_0$ |
| average speed = $\frac{\text{total distance}}{\text{total time}}$ | avg. velocity = $\frac{\text{displacement}}{\text{time}}$ |
| instantaneous speed - speed at a given moment only | ex if $\vec{d} = 0$ then $\vec{v} = 0$ even if been travelling for hours |

Acceleration (vector) - happens for change of speed and/or a change of direction.

$$\vec{a} = \frac{\Delta\vec{v}}{t}$$

Positive and Negative Acceleration (pg 44)

+ →
← −

| | speeding up | slowing down |
| --- | --- | --- |
| pos. accel | $\vec{v}$ → <br> $\vec{a}$ → | $\vec{v}$ ← <br> $\vec{a}$ → |
| neg accel | $\vec{v}$ ← <br> $\vec{a}$ ← | $\vec{v}$ → <br> $\vec{a}$ ← |
| | ⇑ <br> $\vec{v}$ + $\vec{a}$ are in same | ⇑ <br> $\vec{v}$ and $\vec{a}$ are in opposite directions to |

$\vec{v}$ + $\vec{a}$ are in same direction to speed up

$\vec{v}$ and $\vec{a}$ are in opposite directions to slow down

## Units

m, s, $\frac{m}{s}$, $\frac{m}{s^2}$

conversion: $\frac{m}{s} \rightarrow \frac{km}{h}$

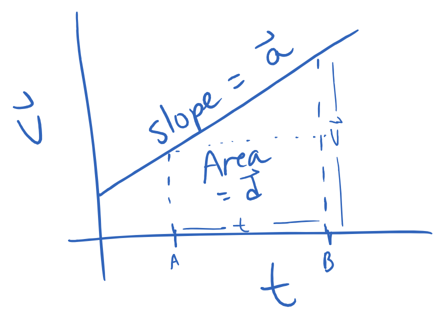
$$10\,\frac{\cancel{m}}{\cancel{s}} \times \frac{1\,km}{1000\,\cancel{m}} \times \frac{3600\,\cancel{s}}{1\,hr} = 10 \times 3.6\,\frac{km}{h} = 36\,\frac{km}{h}$$

in general

$$\frac{m}{s} \times 3.6 = \frac{km}{h}$$

$$\frac{km}{h} \div 3.6 = \frac{m}{s}$$

## Graphs


Area = l w
= $\vec{v} \cdot t$
= $\vec{d}$

## Formulae

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}}$$

① $\vec{v}_f = \vec{v}_0 + \vec{a}t$

② $\vec{d} = \frac{\vec{v}_0 + \vec{v}_f}{2} \cdot t$

③ $\vec{d} = \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$

④ $\vec{v}_f^{\,2} = \vec{v}_0^{\,2} + 2\vec{a}\vec{d}$

how to determine which formula to use:

- look for missing variable
- ex if no "d" is given or being looked for, then use $v_f = v_0 + at$
- ex if no "$v_f$", then use $d = v_0 t + \frac{1}{2}at^2$

## Gravitation Acceleration

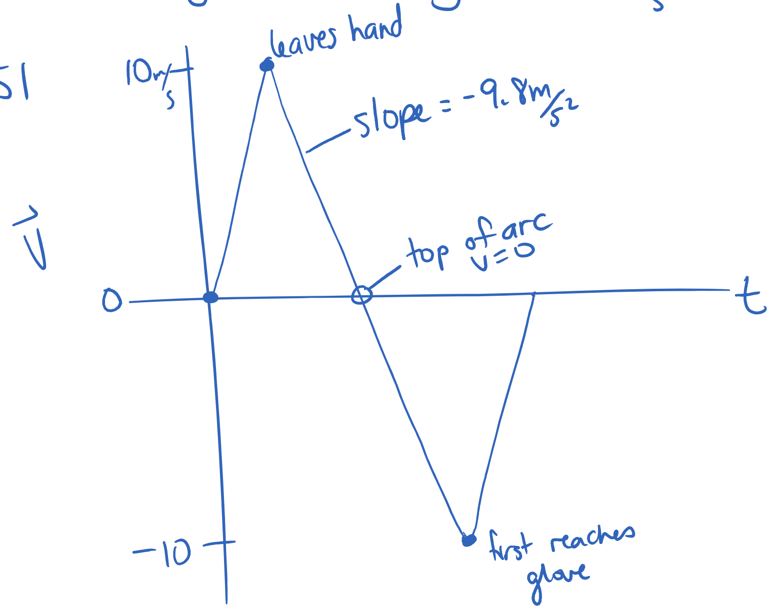
= 9.80 m

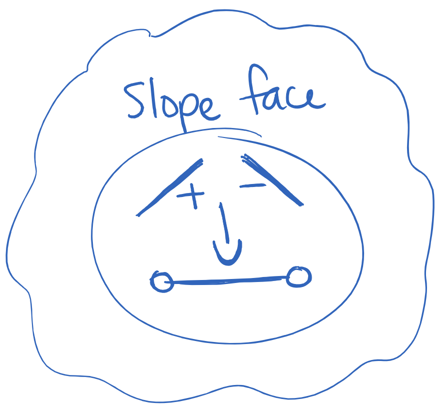
# Gravitation Acceleration

$$g = 9.80 \frac{m}{s^2}$$

if there is an up and down in a problem, consider down as negative, so $g = -9.80 \frac{m}{s^2}$

See graph pg 51




## Practice

pg 46 # 1-3
pg 48 # 1-3 ← #2 change to 2.00m/s², ans = 16.0m
pg 50 # 1-3 ← #2 rounding error: 93m
pg 52 # 1-3